MICROELECTROMECHANICAL DEVICE HAVING SINGLE CRYSTALLINE COMPONENTS AND METALLIC COMPONENTS AND ASSOCIATED FABRICATION METHODS

ABSTRACT OF THE DISCLOSURE

A microelectromechanical (MEMS) device is provided that includes a microelectronic substrate, a microactuator disposed on the substrate and formed of a single crystalline material, and at least one metallic structure disposed on the substrate adjacent the microactuator such that the metallic structure is on substantially the same plane as the microactuator and is actuated thereby. For example, the MEMS device may be a microrelay. As such, the microrelay may include a pair of metallic structures that are controllably brought into contact by selective actuation of the microactuator. While the MEMS device can include various microactuators, one embodiment of the microactuator is a thermally actuated microactuator which advantageously includes a pair of spaced apart supports disposed on the substrate and at least one arched beam extending therebetween. By heating the at least one arched beam of the microactuator, the arched beams will further arch. In an alternate embodiment, the microactuator is an electrostatic microactuator which includes a stationary stator and a movable shuttle. Imposing an electrical bias between the stator and the shuttle causes the shuttle to move with respect to the stator. Thus, on actuation, the microactuator moves between a first position in which the microactuator is spaced apart from the at least one metallic structure to a second position in which the microactuator operably engages the at least one metallic structure. Several advantageous methods for fabricating a MEMS device having both single crystal components and metallic components are also provided.

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